

This purchase description is issued only for use pending promulgation of a MIL specification covering this item.

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PA-PD-274  
9 April 1953

**PURCHASE DESCRIPTION**

**BARRIER MATERIAL, FLEXIBLE  
WATER-VAPORPROOF, HEAVY DUTY**

**1. SCOPE**

1.1 Scope.--This purchase description covers heavy duty water-vaporproof barrier-material for use in packaging by the Armed Forces.

1.2 Classification.--Water-vaporproof barrier-material shall be of one type and class.

**2. APPLICABLE SPECIFICATIONS, STANDARDS, DRAWINGS AND PUBLICATIONS**

2.1 The following specifications and standards, and all specifications and standards referenced thereon, of the issue in effect on date of invitation for bids, form a part of this purchase description:

**SPECIFICATIONS**

**FEDERAL**

NN-B-621	Boxes; Wood, Nailed and Lock-Corner
P-S-661	Solvent; Dry Cleaning
QQ-A-355	Aluminum Alloy (24S), Plate and Sheet
QQ-S-636	Steel; Carbon (Low Carbon), Sheets and Strips
UU-D-723	Drums, Fiberboard (Domestic Type)
UU-P-31	Paper; General Specifications and Methods of Testing
CCC-T-191	Textiles; General Specifications, Test Methods
TT-P-141	Paint, Varnish, Lacquer, and Related Materials: Methods of Inspection, Sampling, and Testing
UU-I-723	Drums, Fiberboard (Domestic type)

**MILITARY**

JAN-P-105	Packaging and Packing for Overseas
JAN-P-106	Wood, Cleated, Plywood
MIL-P-116	Packaging and Packing for Overseas Shipment-Boxes, Wood, Nailed
JAN-P-125	Preservation, Methods of
JAN-P-127	Packaging and Packing for Overseas Shipment-Barrier-Materials, Waterproof, Flexible
MIL-A-140	Packaging and Packing for Overseas Shipment-Tape, Adhesive, Pressure Sensitive, Water Resistant
MIL-D-3464	Packaging and Packing for Overseas Shipment-Adhesives Water-Resistant, Case-Liner
MIL-G-10352	Desiccants (Activated) in Bags; For Static Dehumidification and Packaging
	Gasket Material, Moisture-Vaporproof-Barrier Application

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## STANDARDS

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## MILITARY

MIL-STD-129 Marking of Shipments  
 MIL-STD-105 Sampling Procedure and Tables For Inspection By Attributes

(Copies of specifications and standards required by contractors in connection with specific procurement functions should be obtained from the procuring agency or as directed by the contracting officer.)

## 3. REQUIREMENTS

3.1 Water-vaporproof barrier material shall have the following minimum construction.

<u>Ply Number</u>	<u>Material</u>
1	.001 inch thick vinyl film
2 and 4	.00045 inch thick aluminum foil
3 and 5	2.5 ounce minimum per square yard plain weave nylon woven from 210 denier, 34 filament, one turn, "Z" twist high tenacity flat non-twisted fiber (Fiberthin or approved substantial equal) (see 6.5, 6.6 and 6.7)

The nylon shall have the minimum physical properties specified in Table I when tested in accordance with Federal Specification CCC-T-191.

TABLE I

Breaking Strength (Warp and Fill Direction), lbs.	150
Tearing Strength (Warp and Fill Direction), lbs.	25
Weight, Ounces Per Square Yard	2.5

3.2 Construction.-Heavy duty flexible water-vaporproof barrier-material shall be constructed of 5 plies as specified in 3.1, laminated together by suitable adhesives (see 6.8) and processes (see 6.9), to provide a barrier-material that will insure compliance with the performance requirements of this purchase description. The material shall be of uniform construction so as to maintain a low water-vapor transmission rate and adequate strength, both in the material itself and in the seams and closures, when exposed to the range of air temperatures and relative humidities specified in this purchase description. In addition the barrier material shall be resistant to fungus deterioration.

3.3 Form.-The material shall be furnished in rolls of approximately 100 yards in length and 36  $\pm$  1/8 inch in width. When purchased in cut sheets, the length and width of the material shall be specified in the contract or purchase order.

3.4 Qualification (see 6.3)

3.4.1 Water-vapor transmission rate.-The water-vapor transmission rate shall not exceed 0.05 gram/100 sq. in./24 hours, before and after aging in accordance with 4.5.1, and when tested in accordance with 4.5.2.

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3.4.2 Seam strength.-The barrier-material as received and after aging shall be heat-sealable at a temperature not to exceed 525°F and shall be fabricated in such a manner as to produce seams or closures which shall not allow separation of the barrier sheets beyond 25 percent of the width of the seam when tested in accordance with 4.5.3. There shall be no delamination of laminated barrier-material at the heat-sealed area after sealing.

3.4.3 Oil resistance.-The barrier-material shall resist penetration of oil for 96 hours, when tested in accordance with 4.5.4.

3.4.4 Strength characteristics.

3.4.4.1 Dry.-The barrier-material shall be tested in accordance with 4.5.5.1, 4.5.5.2 and 4.5.5.3. Values obtained for bursting strength, tear resistance and tensile strength shall be recorded for comparison purposes to determine compliance with the acceptance test requirements of 4.6.

3.4.4.2 Wet.-The barrier material when tested in accordance with 4.5.5.4 shall retain a minimum of 80% of the values obtained when the material is tested in accordance with 4.5.5.1, 4.5.5.2 and 4.5.5.3.

3.4.5 Resistance to blocking.-The barrier-material shall exhibit no delamination or rupture, when tested in accordance with 4.5.6.

3.4.6 Corrosive properties.-There shall be no evidence of corrosion or staining on polished aluminum and steel panels in excess of that which can be removed by gentle rubbing with a clean soft cotton cloth, when tested in accordance with 4.5.7.

3.4.7 Performance.-The barrier-material, together with seals, closures, gaskets, and gasket adhesives, if any, when applied as a package barrier and tested in accordance with 4.5.8, shall not permit the entrance of liquid water, and the increase in moisture content of the enclosed desiccant after cyclic exposure tests shall be not more than 5 percent on the anhydrous basis in more than one of the test packages following the second cyclic exposure test.

3.4.8 Heat resistance.-The barrier-material shall show no delamination, when tested in accordance with 4.5.9.

3.4.9 Resistance to accelerated weathering.-The barrier-material when subjected to the tests specified in 4.5.10 shall show no signs of delamination, cracking, ruptures or other defects.

3.5 Identification of material.-The barrier-material under contract or order shall be marked with the manufacturer's recommended heat-seal procedure to be used on heat-sealer of jaw type (temperature, pressure, dwell) or rotary or band type (pre-heat, speed, pressure, and temperature), manufacturer's name, manufacturer's designation, month and year of manufacture, and specification number. The letters and figures of marking shall be a minimum of 1/8 inch high, clear, legible, and waterproof. The marking shall appear on the backing surface of the material. The complete markings shall be continuous lengthwise, with a maximum of 2 inches between groups of markings and shall appear at least once in each 12 inches of width of the roll. The color of the marking shall approximate color No. 3115 of Federal Specification TT-C-595, Colors; (For) Ready-Mixed Paints.

3.6 Workmanship.-Water-vaporproof barrier-material shall be manufactured in a manner to provide uniform construction, free from pinholes, tears, cuts or other visible defects which would impair its usefulness. Finished material shall not stick together to an extent that will cause tearing or injury to surface when unrolled, or when sheets are separated.

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#### 4. SAMPLING, INSPECTION, AND TEST PROCEDURES.

4.1 Lot.-A lot of heavy duty flexible water-vaporproof barrier-material shall consist of all material made by the same process by one manufacturer and submitted for inspection at one time, and not more than 500 rolls, maximum.

##### 4.2 Sampling.

4.2.1 Qualification.-Qualification test samples shall consist of 25 square yards of barrier-material and, in addition, six test specimens each with recommended seam or joint at centerline, as shown in figure 1. Test samples shall be accompanied by a report showing results for all tests required by qualification by this purchase description except performance test (see 4.5.8). Where qualification tests require results before and after aging, manufacturers are not required to furnish results of tests after aging. Complete directions for sealing (including temperature, dwell time, and pressure, if applicable) shall be furnished. The test specimens and samples shall be forwarded to the Commanding Officer, Picatinny Arsenal, Dover, N. J., ATTN: Technical Division, plainly identified by securely attached durable tags marked with the following information:

Samples for Qualification Test  
Name of Manufacturer  
Manufacturer's code designation  
Month and year of manufacture  
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The specimens shall be made from production quantities of the materials submitted. The materials shall not be specially prepared, nor shall a specimen be specially treated or processed in any manner or any extent different from methods used in regular production run.

4.2.2 Acceptance.-Samples for tests specified in 4.5.2, 4.5.3, and 4.5.5 shall be selected in accordance with Standard MIL-STD-105 using Inspection Level I, Table IV with an A.Q.L. of 4 percent.

(Note: The number of samples presently specified in 4.5.2, 4.5.3 and 4.5.5 apply for Qualification tests only.)

##### 4.3 Inspection

4.3.1 At place of manufacture.-Visual and dimensional inspection shall be performed by the contractor under the supervision of the government inspector. Upon receipt by the inspector of a warranty from the contractor that the material submitted complies with the remaining requirements of this purchase description the lot may be released for shipment. However, if the previous lot of material produced by the contractor fails on any test, the lot shall not be released for shipment until receipt by the procuring agency of a satisfactory report from the government approved testing Laboratory (see 4.3.2).

4.3.2 At Government approved laboratory.-The barrier-material shall be properly identified and forwarded to the Government approved laboratory specified in the contract or purchase order, to determine compliance with the remaining acceptance requirements of this purchase description. The laboratory shall forward the results of the tests to the procuring agency as soon as possible. If

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laboratory tests indicate the barrier-material does not comply with the requirements of this purchase description, the procuring agency may require the contractor to remove the entire lot, or any portion thereof, from consignee and replace it with satisfactory material. If the lot of barrier-material is found to be defective, the contractor shall be assessed with cost of laboratory costs, shall remove the defective material from consignee at his own expense, and shall provide reimbursement for transportation charges into consignee's premises.

#### 4.4 Classification of tests.

4.4.1 Qualification.-Qualification tests are those tests accomplished on materials submitted for qualification as satisfactory products.

4.4.2 Acceptance.-Acceptance tests are those tests accomplished on samples for acceptance of the material under contract.

#### 4.5 Tests.

4.5.1 Aging for test.-Representative sections of barrier-material required for tests specified in the 4.5.2.1 and 4.5.3.2 shall be stored in an oven maintained at a temperature of  $160^{\circ} \pm 5^{\circ}\text{F}$  and  $60 \pm 5$  percent relative humidity for 72 hours. The sections shall be arranged in the oven in a manner which allows circulation of air against all surfaces of the barrier.

#### 4.5.2 Water-vapor transmission rate.

4.5.2.1 Preparation of specimens.-The material to be tested shall be examined for tears, pin holes, etc., and six 6-inch squares shall be selected. Four equidistant parallel folds shall be placed in each square by alternating the direction of folding on each successive fold so that the apex of each successive fold is facing an opposite side of the sheet in accordion style. The folded square shall then be creased by placing it between two 6 x 10-inch flat rigid plates and applying a total weight of 36 pounds (6 pounds per inch of length of fold) for 1 minute. The center of gravity of the weight shall be over the center of the sample. The square shall then be opened and the folding and creasing-under-weight process repeated, making the second series of four folds perpendicular to the original folds. A circular specimen with a 6-inch diameter shall then be cut from the center of each of the creased squares. These six specimens shall then be tested, three before aging and three after aging.

#### 4.5.2.2 Apparatus.

4.5.2.2.1 Humidity cabinet.-The humidity cabinet for this test is standard equipment known as the General Foods Humidity cabinet and shall provide a relative humidity of 90 to 95 percent at a temperature of  $100^{\circ} \pm 1^{\circ}\text{F}$  with no condensation on the test dishes or in the space in which the test dishes are placed.

4.5.2.2.2 Test dishes and brass template.-The test dishes and brass template shall conform to the standard size to be used in the standard General Foods Humidity cabinet.

4.5.2.3 Procedure.-A 50 ml. beaker shall be filled with 8-mesh anhydrous calcium chloride (min. 96 percent as  $\text{CaCl}_2$ ) and then emptied into a thoroughly cleaned test dish. The calcium chloride shall be spread evenly over the bottom surface of the dish and the test specimen placed over the calcium chloride concentric with the rim of the dish. The brass template shall be carefully placed over the film, care being taken to have the template centered with respect to the dish top before allowing it to come into contact with the material being tested.

A wax mixture consisting of 60 percent amorphous wax and 40 percent paraffin wax shall be heated in a porcelain crucible to at least  $212^{\circ}\text{F}$ . It shall then be poured through a 20-mesh screen to remove any large pieces of foreign matter and film that may be in the wax. The wax mixture shall be poured into the annular

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space between the template and the rim of the test dish, filling up this space to approximately flush with the top of the template. The dish shall then be cooled to harden the wax sufficiently so that the template can be removed. Care shall be taken not to cool the dish so long as to make the wax hard and brittle. The template shall be removed by inserting a screw-driver under an ear of the template and giving a slight twist, tending to press the wax against the dish and at the same time raising the template. This shall be done on the three ears of the template. Any difficulty experienced in extracting the template from the dish can be overcome by first rubbing the edge of the template with vaseline before pouring the wax.

After the template has been removed, the dish shall be inspected for loose pieces of wax, etc., and examined for flaws in the seal. It shall then be conditioned in the humidity cabinet for 48 hours. It shall then be removed from the humidity cabinet, cooled for 15 minutes in a room maintained at  $73^{\circ} \pm 3.5^{\circ}\text{F}$ . with  $50 \pm 2$  percent relative humidity, and weighed on an analytical balance. The dish shall then be replaced in the humidity cabinet for a period of 68 hours, removed, cooled as before and reweighed. Exposure in the humidity cabinet, cooling and weighing shall be repeated at intervals of 24 hours thereafter until two consecutive weighings indicated that a practically constant rate of vapor transmission has been attained. The water-vapor transmission rate shall be reported in grams of moisture transmitted per 100 square inches of area for 24 hours and shall be calculated as follows:

$$\text{Water-vapor transmission rate} = \frac{(W_2 - W_1) \times 2400}{T \times A}$$

where:

- $W_1$  = weight in grams at beginning of exposure period
- $W_2$  = weight in grams at end of exposure period
- $T$  = exposure period, in hours (68 hours specified)
- $A$  = area exposed, in square inches.

The results for each group of three specimens (i.e., three before aging and three after aging) shall be averaged and reported as the final result. If either group of three specimens indicates inconsistent values between individual results, a duplicate set of tests for the group in question shall be conducted to determine whether the variance is due to error in the procedure or to lack of uniformity in the sample submitted. If error in procedure is indicated, the results for the first set of specimens shall be disregarded and the results for the second set of three specimens shall be averaged and reported.

#### 4.5.3 Seam strength.

4.5.3.1 Two 36 by 5-inch specimens shall be folded, heat-seal face to heat-seal face, to provide specimens 36 by  $2\frac{1}{2}$  inches, and a seal in accordance with the manufacturer's recommendations made adjacent to the folded edge of the material. Two 1-inch wide specimens shall be cut approximately 12 inches from each end of each 36-inch specimen. Four of the 1-inch wide specimens shall be tested after being conditioned for a minimum of 4 hours at room temperature subsequent to sealing. The remaining four 1-inch wide specimens shall be subjected to the aging test prescribed in 4.5.1, prior to the seam strength test. The sealed specimens shall be unfolded and one end of each strip shall be clamped so that the specimens hang freely. Two of the specimens conditioned at room temperature and two specimens subjected to the aging test shall have a 2-pound weight attached

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to the free end and shall be placed in an oven maintained at  $100^{\circ} \pm 5^{\circ}\text{F}$ . for 1 hour. The remainder of the specimens shall have a 10-ounce weight attached to the free end and shall be placed in an oven maintained at  $160^{\circ} \pm 5^{\circ}\text{F}$ . for 1 hour.

4.5.3.2 One 36 by 5-inch specimen shall be aged as specified in 4.5.1. After aging, the specimen shall be folded and sealed, and four 1-inch wide specimens cut and tested as specified in 4.5.3.1.

4.5.4 Oil resistance of barrier material.-Five specimens, each 4 inches square, shall be conditioned for not less than 16 hours at temperature of  $70^{\circ}$  to  $75^{\circ}\text{F}$ . and relative humidity of  $50 \pm 2$  percent. Each specimen shall be folded without creasing so that corners of the square diagonally opposite are made to coincide. The folded specimen shall then be placed on a smooth, flat base and a 36-pound weight, having a flat under surface as long as the fold or slightly longer, shall be placed gently on the fold so that it is centered over the fold. At the end of 30 seconds, the weight shall be removed, the specimen unfolded, and the procedure repeated to establish a crease on the opposite side of the specimen so that the second crease is formed at right angles to the first. Each specimen shall be placed on a watch glass and 1 ml. of any SAE-30 motor oil shall be applied to the specimen at the intersection of the crease. The treated specimens shall be placed in an oven at  $140^{\circ}\text{F}$ . for 96 hours, then removed and examined. The material shall show no visible delamination, embrittlement, dissolution, or other deterioration which would impair its usefulness.

4.5.5 Strength characteristics.-The results of each of the following tests shall be reported as the average determined on twelve separate specimens for each test (see 3.4.4). All specimens shall be conditioned before testing in accordance with method 102 of Specification UU-P-31, unless otherwise specified.

4.5.5.1 Bursting strength.-Bursting strength shall be determined in accordance with method 112 of Specification UU-P-31, using a Model A Mullen tester. Tests shall be conducted alternately against each face of the test specimens and the results averaged for each specimen. A total of 12 specimens shall be tested.

4.5.5.2 Tear resistance.-Tear resistance shall be determined in accordance with Section IX of Specification CCC-T-191. Tests shall be conducted alternately against each face of the test specimen and the results averaged for each specimen. Twelve specimens shall be tested in each principal direction.

4.5.5.3 Tensile strength.-Tensile strength shall be determined in accordance with Section VI (Grab Method) of Specification CCC-T-191, except that 12 specimens shall be tested in each principal direction.

4.5.5.4 Strength characteristics (Wet).-The results of each of the following tests shall be reported as the average determined on twelve separate specimens for each requirement.

4.5.5.4.1 Wet bursting strength.-Wet bursting strength shall be determined on unconditioned material as specified in 4.5.5.1 except that the specimens shall be immersed in tap water at  $70^{\circ}$  -  $80^{\circ}\text{F}$  for 24 hours, then removed and excess water blotted off by means of absorbent paper before testing. The wet specimens shall attain a value of not less than 80% of the average of the dry values obtained in 4.5.5.1.

4.5.5.4.2 Wet tear resistance.-Wet tear resistance shall be determined on unconditioned material as specified in 4.5.5.2 except that the specimens shall be immersed in tap water at  $70^{\circ}$  -  $80^{\circ}\text{F}$  for 24 hours; then removed and excess water blotted off by means of absorbent paper before testing. The wet specimens shall attain a value of not less than 80% of the average of the dry values obtained in 4.5.5.2.

4.5.5.4.3 Wet tensile strength.-Wet tensile strength shall be determined on unconditioned material as specified in 4.5.5.3 except that the specimens shall

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be immersed in tap water at 70° - 80°F for 24 hours, then removed and excess water blotted off by means of absorbent paper before testing. The wet specimens shall attain a value of not less than 80% of the average of the dry values.

4.5.6 Resistance to blocking.-Two 4 by 4-inch sheets of the material shall be placed heat-seal face to heat-seal face and two placed heat seal face to back on a smooth hard plane surface. A 2 by 2-inch resilient pad shall be centered on top of the sheets and a flat bottom 12 pound weight shall be placed on the pad. The assemblies shall be stored in an oven maintained at a temperature of 160°  $\pm$  5°F. After 24 hours, the specimens shall be removed and allowed to cool for four hours at room temperature. The sheets shall be peeled apart rapidly and examined for delamination or rupture of coating or film.

4.5.7 Corrosive properties.-Two each aluminum alloy, and carbon steel panels 1/16 by 2 by 4 inches, conforming to Specifications QQ-A-355 and QQ-S-636, respectively, shall be polished using a 280-grit polish medium, washed with dry cleaning solvent conforming to Specification P-S-661 and then wiped and dried with a clean cloth. They shall then be packed individually using a closely fitting envelope fabricated from the water-vapor-proof barrier-material heat-seal face to heat-seal face. The envelopes shall be conditioned in accordance with Method 102 of UU-P-31 immediately prior to insertion of the metal panels and sealing. After insertion of the panel, the excess air shall be removed and the envelope closed in accordance with the recommended procedure. The resultant container shall be placed horizontally in an oven on a flat surface to give maximum contact area between the material and the panel. After 48 hours at 160°  $\pm$  5°F. the panels shall be examined for corrosion or staining.

#### 4.5.8 Performance.

4.5.8.1 Preparation of specimens.-Six test specimens shall be prepared. Gaskets, gasket adhesives, etc., shall be furnished and applied by the qualifying agency. Preparation of test packages shall be in accordance with method II a (floating bag) requirements of Specification MIL-P-116. The dehydrating agent shall conform to Class 1 of Specification MIL-D-3464. The quantity of dehydrating agent used in preparation of packages shall be as follows:

$$\text{Dehydrating agent (units)} = 1.6A / 10D$$

where:

A = area in square feet of the barrier-material

D = weight in pounds of any dunnage or blocking or cushioning material enclosed within the barrier.

The desiccant shall be fully activated in accordance with the manufacturer's recommendations before the tests. The dummy load shall be of approximately 50 pounds, net weight, mounted with bolts of 3/8 inch diameter at four locations as shown in figure 1, and shall simulate an electric motor. Each of the test specimens shall then be placed in an unlined, style 4, nailed, wood box, conforming to Specification JAN-P-106, with a gross weight of approximately 70 pounds. The box shall be so constructed as to permit free ingress of spray water on all surfaces. The mounting base shall be made of hardwood and shall form one face of the box, or shall be securely fastened to one face of the box.

4.5.8.2 Apparatus.-Apparatus shall consist of chambers or cabinets providing the atmospheric conditions prescribed in 4.5.8.3.1, simulated rain making equipment, as specified in paragraph 4.3.2.3.8 of Specification MIL-P-116, and a hexagonal box-testing drum of 14-foot diameter, of the type generally in use at box-testing laboratories. The drum shall be revolved at a speed of approximately one revolution per minute.

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## 4.5.8.3 Procedure.

4.5.8.3.1 First eight-day cyclic exposure test.-The nailed wood boxes containing the test specimens shall be exposed to the conditions, and subjected to rough handling in the drum (movement from one face of the drum to the next constituting one fall), according to the following tabulated schedule:

Day	Time	Exposure condition	Condition when rough handled
1	10 am to 4 pm Overnight	Room temperature $160^{\circ} \pm 5^{\circ}\text{F}$ , 60 $\pm$ 4 percent RH	
2	8 8-2 2-4 Overnight	Six falls in drum Room temperature $-65^{\circ} \pm 3^{\circ}\text{F}$ $160^{\circ} \pm 5^{\circ}\text{F}$ , 60 $\pm$ 4 percent RH	Warm
3	8-2 2 2-4 Overnight	Room temperature Six falls in drum $-65^{\circ} \pm 3^{\circ}\text{F}$ $160^{\circ} \pm 5^{\circ}\text{F}$ , 60 $\pm$ 4 percent RH	Room temperature
4	8-2 2-4 4 Overnight	Room temperature $-65^{\circ} \pm 3^{\circ}\text{F}$ Six falls in drum $160^{\circ} \pm 5^{\circ}\text{F}$ , 60 $\pm$ 4 percent RH	Cold
5	8 8-2 2-4 Overnight	Six falls in drum Room temperature Tap-water spray $160^{\circ} \pm 5^{\circ}\text{F}$ , 60 $\pm$ 4 percent RH	Warm
6	8-2 2 2-4 Overnight	Room temperature Six falls in drum Tap-water spray $160^{\circ} \pm 5^{\circ}\text{F}$ , 60 $\pm$ 4 percent RH	Room temperature
7	8-2 2-4 4 Overnight	Room temperature Tap-water spray Six falls in drum $160^{\circ} \pm 5^{\circ}\text{F}$ , 60 $\pm$ 4 percent RH	Room temperature
8	8-2 2-4 Overnight	Room temperature Tap-water spray Room temperature	

The first cyclic exposure test shall be started on a Tuesday so that only one Sunday will be included in the test period. From Friday night to Monday morning the packages shall be stored at  $160^{\circ} \pm 5^{\circ}\text{F}$ , 60  $\pm$  4 percent relative humidity.

4.5.8.3.2 Constant temperature exposure test.-Immediately after completion of the first cyclic exposure test specified in 4.5.8.3.1, the nailed wood boxes containing test specimens shall be exposed to  $160^{\circ} \pm 5^{\circ}\text{F}$ , 60  $\pm$  4 percent relative humidity for 10 consecutive days.

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4.5.8.3.3. Second eight-day cyclic exposure test.-Immediately after completion of the first cyclic exposure test specified in 4.5.8.3.2, the nailed wood boxes containing the test specimens shall be exposed to the conditions, and subjected to rough handling in the drum, according to the schedule tabulated in 4.5.8.3.1. The barriers shall be examined upon completion of the overnight, room-temperature phase of the eighth cycle; and the increase in moisture content of the inclosed desiccant shall be not more than 5 percent on the anhydrous basis in more than one of the test packages.

4.5.9 Resistance to heat.-Cut 3 representative samples of any convenient size and suspend them in a circulating air oven at  $160^{\circ} \pm 5^{\circ}\text{F}$  for 2 weeks. Arrange the specimens in the oven in such a manner to allow circulation of air against all surfaces of the barrier-material. At the end of the 2 week period, remove the specimens from the oven and examine visually for loss of coating, delamination, cracking or separation of plies.

4.5.10 Resistance to accelerated weathering.-Ten  $3\frac{1}{2}$ " by 8" specimens shall be cut from unaged material and subjected to accelerated weathering for 168 hours using an Atlas Twin Arc Apparatus as described in Method 615.2 of Federal Specification TT-P-141. The air temperature within the apparatus shall be  $125^{\circ} \pm 5^{\circ}\text{F}$  and the exposure shall consist of continuous light with no water spray. Five of the specimens shall be tested with the heat seal surface facing the light source and five specimens with the heat seal surface facing away from the light source. At the end of the exposure period, all specimens shall be examined visually for evidence of delamination, cracking or other signs of deterioration. Any change of color alone shall not be cause for rejection.

4.6 Acceptance tests.-Material submitted for acceptance shall be tested to determine compliance with the requirements of 3.4.1, 3.4.2 and 3.4.4.2. In addition the tests specified in 3.4.4.1 shall be conducted. The values obtained in the tests specified in 3.4.4.1 shall not be less than 85% of the values obtained at time of qualification.

4.7 Rejection and retests.

4.7.1 Rejection (acceptance tests).-If samples in relation to the Acceptable Quality Level (AQL), selected in accordance with 4.2 fail to comply with the requirements of this purchase description, the entire lot shall be rejected. A rejected lot may be resubmitted for government inspection provided the manufacturer, after having been informed of the reasons for rejection, has inspected the lot for the deficiency noted and has removed all non-conforming material. The resubmitted lot shall be accepted provided that all new samples, selected in accordance with paragraph 4.2, pass all the tests required by this purchase description.

4.7.2 Retest (qualification tests).-A material rejected by the Government testing agency for qualification according to the requirement of this specification shall not be retested at the request of the manufacturer unless evidence is furnished that changes have been made in the material or sealing process, to correct the defects. The cost of retest shall be borne by the manufacturer.

## 5. PREPARATION FOR DELIVERY

5.1 Application.-The packaging, packing and marking requirements specified herein apply only to direct purchases by or direct shipments to the Government.

5.2 Packaging.-Unless otherwise specified, water-vaporproof barrier-material shall be packaged as follows:

5.2.1 Rolls.-Each roll shall be wound on a substantial core with an inside diameter of not less than three inches and shall be suitably restrained from unwinding.

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5.2.2 Flat cuts.-Flat cuts of material require no interior packaging.

5.3 Packing.-Unless otherwise specified, all items shall receive domestic packing. Shipping containers shall contain the same number of rolls or flat cuts, shall be uniform in size, and shall be snugly packed.

5.3.1 Domestic packing.

5.3.1.1 Rolls.-Unless otherwise specified by the Procuring Agency, each roll packaged as specified in paragraph 5.2.1 shall be tightly packed in a fiber-board drum conforming to Federal Specification UU-D-723, type I. The covers shall be taped to the side walls with 3-inch sisal reinforced tape or equivalent.

5.3.1.2 Flat cuts.-Unless otherwise specified by the Procuring Agency, flat cuts shall be packed in containers conforming to Federal Specification NN-B-621.

5.3.2 Overseas packing.

5.3.2.1 Rolls.-Unless otherwise specified by the Procuring Agency, each roll shall be packed as specified in paragraph 5.3.1.1 with the exception that the tape used in securing the ends shall be 3-inch wide pressure sensitive and waterproof cloth tape conforming to Specification JAN-P-127, type II, grade B. Two of these containers shall be packed in wooden cases to conform to Specification JAN-P-106, style 4, with a minimum 1 1/16 inches thick end cleats, or Specification JAN-P-105, style A.

5.3.2.2 Flat cuts.-Flat cuts shall be packed in boxes conforming to Specification JAN-P-106. Each container shall be provided with a case liner, fabricated from case liner material conforming to Specification JAN-P-125 and sealed with adhesive conforming to Specification MIL-A-140. The seam for the waterproof barrier material shall be three-fourths wide minimum and shall provide waterproofness equal to the barrier material.

5.4 Marking.-All shipping containers shall be marked to comply with Military Standard No. 129 and as follows:

SIZE (NET LINEAL YARDAGE \* OF ROLL OR DIMENSION OF FLAT CUT) "STORE IN COOL DRY PLACE"

\* Net lineal yardage is the number of yards of usable material in the roll.

## 6. NOTES

6.1 Ordering data.-Requests, requisitions, schedules, and contracts or orders should state whether domestic or overseas packing and marking are required and specify the following:

Title, number, and date of this purchase description  
Size and form (i.e., rolls or flat cuts) required (see 3.3).

6.2 To supply water-vaporproof barrier-material under this purchase description, an approval of the material must be obtained. Application for such approval should be made in duplicate to the designated qualifying agency. Specimens for test shall be submitted in accordance with 4.2.1 and in accordance with instructions from the qualifying agency. A purchaser buying for resale to the Government shall notify his vendor to that effect in order that the vendor shall have the opportunity to submit to each purchaser, in lieu of specimens, evidence showing previous approval of the material directly by the Government purchaser concerned in such resale.

6.3 In the procurement of products requiring qualification, the right is reserved to reject bids on material that has not been subjected to the required tests and found satisfactory for inclusion on the Qualified Products List. The attention of suppliers is called to this requirement, and manufacturers are urged to communicate with the Commanding Officer, Picatinny Arsenal, Dover, N. J., to

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arrange to have the material which they propose to offer, tested for qualification in order that they may be eligible to be awarded contracts or order for the material covered by this purchase description.

6.4 Manufacturer's tests to obtain results for manufacturer's test data will be made by the manufacturer at a private or commercial testing laboratory prior to submission of material to a Government testing agency for qualification.

6.5 Ply 3 and ply 5 (one side only) shall be coated on a spreader as follows:

Prime one side with 0.3 oz/sq. yd. of compound 1 (see 6.6).

Apply seven coats of compound 2 (see 6.8) to give a weight of 2.2 oz/sq. yd. of coating on the first side. The total coating on the first side shall then be 2.5 oz/sq. yd.

Coat the second side of the fabric in the same manner as the first side.

Cure for 8 hours at 260°F

6.6 "Compound 1", which was found to be satisfactory, consisted of the following:

<u>Material</u>	<u>Parts by Weight</u>
Neoprene RT	100.00
Zinc oxide	2.50
Reogen	2.00
Magnesium oxide	2.50
Altax	1.25
MDI-50 (Methylene bis-4-phenylisocyanate)	35.00
Toluene	193.00
Total	336.25

6.7 "Compound 2", which was found to be satisfactory, consisted of the following:

<u>Material</u>	<u>Parts by Weight</u>
Paracril B	91.00
Natural rubber--ribbed smoked sheets	9.00
Whiting	25.55
McNamee clay	25.55
Pelletex	18.18
Zinc oxide	5.00
Stearic acid	1.00
Heliozone	1.50
Sulfur	2.50
Agerite white	2.00
Rotax	2.00
Methyl zimate	0.50
Bondogen	1.82
Vancide 89	1.00
Toluene	263.00
Ethanol	5.00
Total	454.60

6.8 A barrier-material which was found to comply with the requirements of this purchase description was laminated using the following adhesives:

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Adhesive 1

<u>Material</u>	<u>Parts by Weight</u>
Vynlite VMCH	75.00
Vynlite VYDR	25.00
PBK-11 plastic pigment dispersion	25.00
Stabilizer #52	2.50
Stabilizer E6B	2.50
Propylene oxide	0.24
Tetrahydrofuran	296.00
Metyl ethyl ketone	80.52
Total	506.76

Adhesive 2

<u>Material</u>	<u>Parts by Weight</u>
Neoprene RT	100.00
Sulfur	10.00
Zinc oxide	10.00
Magnesium oxide	5.00
Butyl zimate	5.00
Vancide 89	1.00
MDI-50 (methylene bis-4-phenylisocyanate)	40.00
Toluene	360.00
Total	531.00

6.9 A barrier-material which was found to comply with the requirements of the purchase description was made using the following process:

Laminate ply 1 to ply 2 with adhesive 1 (0.5 oz/sq. yd.), using one laminating roll at 280°F. and the other roll cold, at a speed of 9 yards/minute.

Laminate ply 3 to aluminum side (ply 2) of above lamination with adhesive 2 (0.75 oz/sq. yd.), using one laminating roll of rubber and the other roll of steel, both at room temperature, at a speed of 9 yards/minute.

Laminate ply 4 to coated fabric side (ply 3) of above lamination with adhesive 2 (0.75 oz/sq. yd.), using one laminating roll of rubber and the other roll of steel, both at room temperature, at a speed of 9 yards/minute.

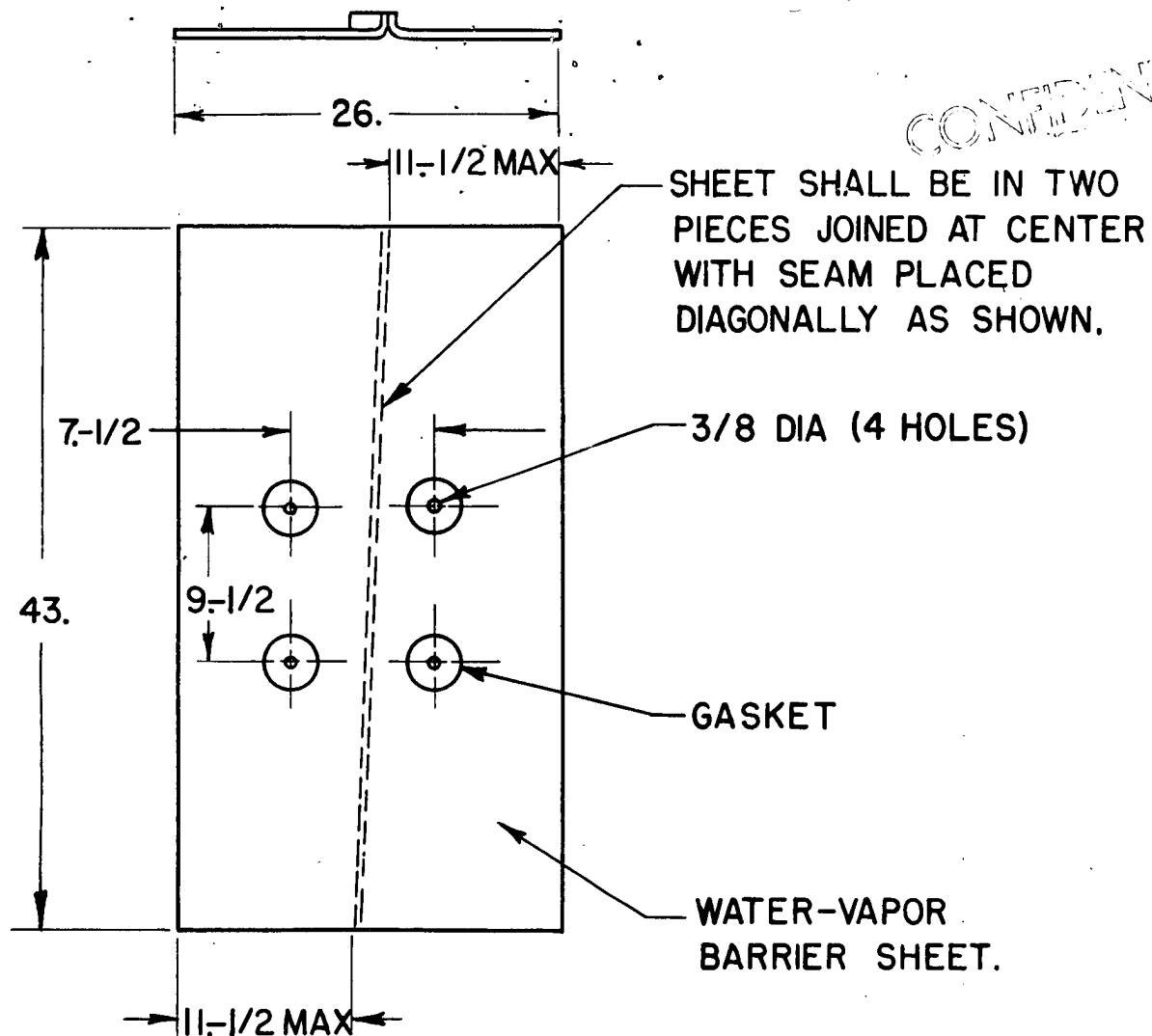
Laminate ply 5 to aluminum side (ply 4) of above lamination with adhesive 2 (0.75 oz/sq. yd.) using one laminating roll of rubber and the other roll of steel, both at room temperature, at a speed of 9 yards/minute.

NOTICE: When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use or sell any patented invention that may in any way be related thereto.

Custodian:

Picatinny Arsenal, Dover, N. J.

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ALL DIMENSIONS ARE IN INCHES.

**NOTE :**

GASKETS SHALL BE APPLIED WITH A MOISTURE RESISTANT ADHESIVE TO EACH FACE OF THE SHEET AT EACH HOLE LOCATION.

LAYOUT OF WATER-VAPOR BARRIER SHEET FOR CYCLIC TEST.

**FIGURE I**

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